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BOTANY.—*The Mascarene cabbage palm as a new genus.* O. F. COOK, Bureau of Plant Industry.

Soon after landing at Payta, in northern Peru, March 24, 1915, my attention was attracted by a palm growing in the garden of the plaza. Seen from a distance there was a marked similarity in habit and general appearance to the coconut palm, but the proportions were smaller throughout. With a closer view it was soon apparent that the palm did not belong to any American group but to the Old World family Arecaceae, natives of the islands and shores of the Pacific and Indian oceans. Relationship with the genus *Loroma*, described in a former volume of this JOURNAL,[1] became apparent from an examination of the flowers and fruits, and notes were made of the following features:

Trunk rimose, about 6 inches in diameter, thickened at the base to a foot or over, bearing a crown of about 12 leaves, of the general form, texture, and light yellowish-green color of the leaves of the coconut palm, but only about half as long (7–8 feet), with 60–62 pinnae on each side of the rachis. Leaf sheaths grayish, scaly on the back. Lowest pinnae much reduced, the first measuring 8 mm. wide by about 18 cm. long, remaining connected with those above by long marginal ribbons. Second pinnae 9 mm. by 17 cm.; fifth pinnae 1.3 cm. by 28 cm., split at tip; middle pinnae 5.3 by 87 cm., split at the tip a distance of 10–12 cm.; penultimate pinnae 2.8 by 35 cm.; uppermost pinnae about 2.7 cm. by 30 cm., but irregular, consisting of 2–3 small united segments.

Inflorescence attaining a length of 62 cm., the basal joint 4 cm. long, very broad, encircling the trunk. Second joint 1 cm. long, the branches

[1] Journ. Wash. Acad. Sci., 5: 117. 1915.

beginning only 1 cm. or less above the spathe scar. Branches 58, all simple, attaining a length of 45–53 cm., about 5 mm. thick, at base 1 cm. or more, tapering to the apex. Total length of axis 32 cm., 26 cm. above lowest branch.

Buds and flowers light green, the petals somewhat yellowish green, the sepals paler and more whitish. Filaments and pistillode white. Anthers and pollen rather dull, light yellow or buff. Flowers mostly in groups of two, in broad impressions or notches; only staminate flowers on the branch collected. Pistillate flowers with the calyx much larger, and petals imbricate instead of valvate, as shown on the fruits. Pistillode narrowly conic, from a somewhat broader base, slightly lobed at apex, over half as long as the filaments. Mature fruits purplish, with grayish bloom in the wrinkles, pointed-oval, 1.6 cm. long, 9 mm. wide, with a mesocarp of vertical fibers and an endocarp of columnar shell tissue, as in *Loroma* and *Archontophoenix*. Seeds 1.1 cm. long by 7 mm. wide, oval, showing an open network of ruminations, much plainer than in *Archontophoenix*.

Examined afterward at Washington, the seeds seemed to be the same as those representing *Dictyosperma album* (Bory) in the collections. The species is a native of the Mascarene Islands in the Indian Ocean, east of Madagascar, and is rather well known horticulturally.

Nevertheless, the identification appeared unsatisfactory because the generic description of *Dictyosperma* was in some repects distinctly inapplicable, and the availability of the name *Dictyosperma* was brought into question by Mr. S. C. Stuntz. The same name had been used twice before being applied to the palm, first in the form *Dyctisperma*, proposed by Rafinesque in 1838 for a genus of Rubiaceae, and again as *Dictyospermum*, applied by Wight in 1853 to a genus of spiderworts. Its application to a genus of palms, in the form *Dictyosperma*, dates from 1875. Still another version, *Dyctosperma*, perhaps accidental, appeared in a list of palms published by Wendland in 1878.[2]

No detailed description or reference to particular material is given in connection with the original description of *Dictyosperma*, but the distribution, "*Insulae Borboniae et Franciae*," is stated, also the "*Species typica: Areca alba* Bory."[3] But in spite of the

[2] KERCHOVE DE DENTERGHEM, O. Les Palmiers, p. 254. 1878.

[3] WENDLAND, H., and DRUDE, O. *Palmae Australasicae*. Linnaea, **39**: 181. 1875.

designation of a generic type the application of the name Dictyosperma appears somewhat uncertain. The possibility has to be considered that the genus was not in reality based on the true *Areca alba* Bory, but upon some other palm or palms whose characters had been adopted as those of Bory's species. The original description of the genus includes several characters that do not appear in the palm studied at Payta. In this the flowers are crowded irregularly and are often in pairs or solitary, instead of being arranged in clusters of three, distichous at the base of the branches and in spirals above. The pistillode is conic and tapering instead of long and columnar, and the fruit rather narrowly conic-oval, instead of globose-elliptic.

Thus the problem is not merely to find a name that can be used in place of Dictyosperma, if this be rejected as a homonym, but to have a generic designation that is more definitely applicable to the palm current in the horticultural world as *Areca alba* or *Dictyosperma album*. Under the circumstances it appears inadvisable to propose a new name merely as a substitute for Dictyosperma, since this might carry over to the future the same uncertainty that now attends the application of this generic name. These possibilities of further confusion may be reduced by considering the specimens collected at Payta as type material of a new genus, for which the name Linoma is proposed. The specimens have been labeled *Linoma alba* (Bory), deposited in the U. S. National Herbarium, and catalogued under numbers 866367, 866368, 866369, and 866370.

Linoma Cook, gen. nov.

Trunk solitary, rather robust, distinctly enlarged at base, with rather short internodes and deeply impressed leaf-scars. Leaves large, compound, with very numerous lanceolate pinnae, slender, splitting at the tip, not praemorse.

Spathes two, both complete, thin and membranous in texture, promptly deciduous as soon as released by the fall of the subtending leaf.

Inflorescence with numerous, simple, tapering branches, the flowers crowded irregularly on the axis, inserted singly or in pairs in distinct notches or pits.

Flowers pale green, the staminate with small, triangular sepals, rather thick and fleshy in the middle, prominent or somewhat carinate

on the back; petals oblong-oval, narrowed and somewhat apiculate at the tip, valvate in the bud; stamens 6, the anthers much longer than the filaments in the bud, but exserted at anthesis, when the filaments somewhat exceed the petals. Pistillode tapering gradually from a rather robust conic base, distinctly but minutely tridentate at apex, distinctly exceeded by the mature filaments. Pistillate flowers with sepals and pistils similar, broadly suborbicular, subcordate at base, the petals over twice as long as the sepals, somewhat apiculate at apex, widely overlapping to form a rather deep cup. Staminodes minute, broadly triangular, persistent.

Fruit dull purplish at maturity, nearly symmetrical, rather narrowly conic-oval or subfusiform, tapering abruptly below but much more gradually above, and with an abruptly shouldered apical stigma-scar; pericarp fleshy, greenish, very thin, when dry adherent to the thin mesocarp, and this in turn to the thin, bony endocarp; mesocarp fibers fine, close-set, frequently branched or anastomosing but the branches not diverging; endocarp thin and fragile, but consisting of a distinct layer of bony palisade tissue, as in *Archontophoenix*.

Seed oval, somewhat flattened at the base and slightly apiculate above at the chalaza; raphe scarcely impressed, without distinct fibers, but giving rise at the chalaza and sparingly elsewhere to an open network of impressed fibers following the grooves of the deep radial ruminations. Embryo erect, basal.

As diagnostic characters may be mentioned the simply branched inflorescence, the small number of stamens, the rather narrowly oval fruit and seed, the mesocarp of fine compact fibers, and the bony endocarp. The last feature is shared with *Archontophoenix*, but not the others. The broad coarse mesocarp fibers and adherent endocarp of *Loroma* are very different.

In general habit and aspect *Linoma* is not unlike *Loroma*, which shares the attractive resemblance to the coconut palm. A few days after leaving Payta a fine display of *Loroma* was seen in the Plaza de Armas, at Lima, in front of the Cathedral where tourists go to pay their respects to the bones of Pizarro.

The generic name alludes to the fine, compact texture of the fibrous mesocarp layer of the fruit, a feature which distinguishes at once this genus from *Loroma* and *Archontophoenix*.

The mesocarp fibers are much more numerous, finer, and closer than those of *Loroma*. The individual fibers begin to branch not far above the base, and the divisions often split again near the middle of the seed, and then taper gradually, becoming very delicate before the apex is reached. All of the fibers are very closely united, forming a much thinner and more compact coat than in *Loroma* or *Archontophoenix*.

Two of the fibers lying above the raphe are thicker and more prominent than the others and remain unbranched.

The lack of fibers on the raphe is a rather peculiar feature. A vertical band of a paler color is visible on the inside of the endocarp running from a basal expansion below the embryo to an apical pit at the chalaza. Five or six of the grooves corresponding to the ruminations radiate from the chalaza. The seed when sectioned transversely near the middle also shows grooves, as more or less regular radial divisions around a solid central core. The number of radiating grooves varies from 8 to 11.

The shape of the seed may be considered as a resemblance to *Seaforthia* and *Ptychosperma*, but there are no indications of the broad longitudinal grooves that characterize the seeds of those genera.

The characters of the pistillodes in this group of palms show an unusual form of specialization of these rudimentary organs. The usual tendency in the evolution of unisexual flowers is to reduce the functionless organs, or to suppress them altogether. The staminodes of these palms are mere rudiments of stamens, but the pistillodes show distinct tendencies to share the characters of the filaments, in size, form, and texture. This tendency is least apparent in *Loroma*, is moderately pronounced in *Linoma*, and is best developed in *Seaforthia* and *Archontophoenix*, where the pistillodes even exceed the filaments. Whether the pistillode will be found in any case to be replaced by a normal functional stamen, remains to be seen. Such a change, in which one organ assumes characters that belonged originally to another, is recognized as representing a general class of evolutionary phenomena called translocation or metaphanic variations.[4]

The spathes when fresh are of a thin, fleshy or membranous texture, the inner more delicate, becoming chartaceous when dry and splitting readily into longitudinal shreds. As in *Loroma* the original function of the spathes in protecting the young inflorescences has been assumed by the leaf sheaths. The inflorescence with its spathes remains completely enclosed by the leaf sheath until the flowering stage is reached, being unable to emerge until the leaf falls. Very soon after this the spathes also fall off and the flowers open. The outer and inner spathes of *Linoma* are both complete, and of nearly equal length, but the outer is much broader. The margins are broadly carinate-alate, with the edges very thin and densely pilose, at least near the apex.

[4] Cook, O. F. *Brachysm, a hereditary deformity of cotton and other plants.* Journ. Agr. Research, **4**: 397. 1915.

The inner spathes also have a distinct but very narrow carina on each side, running about halfway up. The tip is distinctly apiculate, but not produced. The outer surface is even, but dull, and of a rather light rusty-brown color, while the inner surface appears smooth and shining, but is marked with distinct slightly prominent longitudinal brownish lines, with finer lines and wrinkles between, representing the finer ramifications of the fibro-vascular system.

The number of pinnae and several other features noted at Payta seem not to have been recorded before. Bory and Martius refer to petioles and other parts of leaves as sometimes tinged with red, which may have caused confusion with another palm from Réunion, described by Bory as *Areca rubra*, but now placed in the genus *Acanthophoenix*. It is distinguished readily by the presence of spines on the trunks and leaf-bases. A third species, *Areca crinita*, also described by Bory from the same island, has the trunk and leaf-bases clothed with slender curved spines and hairs. This also is referred by modern botanists to *Acanthophoenix*.

It appears from Bory's account that all three species afford edible "cabbages," but the species now referred to *Acanthophoenix* are said to grow in the mountains, while *Areca alba* is said to prefer the shores and inhabited parts of the island.

It might be presumed that this is the species that is now put up in tins and shipped to Europe and America as a salad delicacy, under the name "hearts of palms" (*coeur de palmier*). A study of a specimen of this commercial product shows the presence of minute slender spines embedded in the loose flocculent coating of the surfaces of the embryonic leaves, which would indicate that the material represents *Acanthophoenix*.

In addition to seeds that have been received on different occasions from commercial horticulturists the Office of Seed and Plant Introduction, Bureau of Plant Industry, has received seeds closely similar to those collected at Payta from Mr. G. Regnard, Port Louis, Mauritius, accompanied by the following note:

> A palm that attains a height of 50 feet. Young plants have dark red margins on new leaves which diminishes when the tree becomes older. The true red variety is getting very scarce now as almost all the trees newly planted are a cross mixture with the white. These seeds were gathered on true red sort in a wide plantation of them. The cabbage of this palm is commonly eaten here and has a quite delicate flavor.

These seeds have the Inventory number 38,696. Other importations are numbered 1928, 1929, and 42,365.

ZOOLOGY.—*A revision of the crinoid family Antedonidae, with the diagnoses of nine new genera.*[1] AUSTIN H. CLARK, National Museum.

The family Antedonidae is the most universally distributed of all the families of recent crinoids; its species occur everywhere, ranging from the tropical littoral in both hemispheres uninterruptedly down to the greatest depths at which crinoids have been found, and include all of the strictly antarctic and all of the arctic comatulids.

Owing to the difficulty involved in dealing with the species of this family, which arises chiefly from the altogether extraordinary brittleness and fragility of the great majority, and the resultant lack of some essential feature or other in very many of the published descriptions, no really satisfactory disposition of the included types has as yet been proposed; but it is believed that the following arrangement more nearly represents the true interrelationships of the component species than any of its predecessors.

The species referable to the family Antedonidae fall naturally into forty genera, which in turn are distributed among seven well characterized groups, ranking as subfamilies. These subfamilies with their included genera are the following:

ANTEDONINAE: *Antedon, Compsometra, Mastigometra, Euantedon, Toxometra, Dorometra* (nov.), *Eumetra, Iridometra, Hybometra, Andrometra* (nov.), and *Argyrometra* (nov.).
THYSANOMETRINAE: *Thysanometra* and *Coccometra.*
PEROMETRINAE: *Perometra, Nanometra, Erythrometra,* and *Hypalometra.*
HELIOMETRINAE: *Heliometra, Promachocrinus, Anthometra, Solanometra, Florometra,* and *Cyclometra.*
ZENOMETRINAE: *Balanometra, Psathyrometra, Leptometra, Adelometra, Zenometra, Sarametra* (nov.), and *Eumorphometra.*
ISOMETRINAE: *Isometra.*

[1] Published with the permission of the Secretary of the Smithsonian Institution.

BATHYMETRINAE: *Orthometra* (nov.), *Tonrometra* (nov.), *Fariometra* (nov.), *Trichometra*, *Hathrometra*, *Nepiometra* (nov.), *Phrixometra* (nov.), *Thaumatometra*, and *Bathymetra*.

Dorometra, gen. nov.

Genotype.—*Antedon nana* Hartlaub, 1890.

Diagnosis.—P_3 is much the longest and stoutest pinnule on the arm; the cirri are XX-XLV (rarely over XL), with not over 16 segments; these have produced distal ends which overlap the proximal ends of those succeeding, and the outer are much longer than their proximal width; the size is small, the arms being from 23 mm. to 50 mm. long; the brachials have smooth, or only very finely spinous, distal edges.

Geographical Range.—Red Sea to Madagascar and Mauritius, eastward to northern Australia and the East Indies, and northward to southern Japan.

Bathymetrical Range.—From the shore line down to 106 meters.

Included Species.—*Dorometra nana* (Hartlaub), *Dorometra mauritiana* (A. H. Clark), *Dorometra gracilis* (A. H. Clark), *Dorometra briseis* (A. H. Clark), *Dorometra parvicirra* (P. H. Carpenter), *Dorometra aegyptica* (A. H. Clark), and *Dorometra clymene* (A. H. Clark).

Andrometra, gen. nov.

Genotype.—*Antedon psyche* A. H. Clark, 1908.

Diagnosis.—P_2 is much longer than P_1, and longer than P_3 though similar to the latter; the centrodorsal is more or less sharply conical.

Geographical Range.—Andaman Islands to southern Japan.

Bathymetrical Range.—From 54 to 201 (?250) meters.

Included Species.—*Andrometra psyche* (A. H. Clark) and *Andrometra indica* (A. H. Clark).

Argyrometra, gen. nov.

Genotype.—*Iridometra crispa* A. H. Clark, 1908.

Diagnosis.—Centrodorsal conical, broader than high, almost completely covered with cirrus sockets which decrease in size toward the apex; these are from LX to LXXX in number; cirri very fragile, with 12–17 more or less elongated segments; P_3 is of the same length and character as the succeeding pinnules; P_1 and P_2, which may be longer or shorter than the following pinnules, have 12–13 segments, and taper evenly to a point; their component segments become progressively elongated; the brachial structure resembles that of *Antedon petasus;* the size is small, the arms being about 30 mm. in length.

Geographical Range.—Hawaiian Islands to northern New Zealand.

Bathymetrical Range.—From 108 to 293 meters.

Included Species.—*Argyrometra crispa* (A. H. Clark) and *Argyrometra mortenseni*, nov.

Argyrometra mortenseni, sp. nov.

Diagnosis.—This species is easily distinguished from *A. crispa* by the much more expanded distal ends of the cirrus segments (in *crispa* the dorsal and ventral profiles of the cirrus segments are everywhere practically parallel), and by the different relationships of the earlier pinnules.

P_1 is 3.3 mm. long, slender and evenly tapering, composed of 12 segments of which the first is slightly broader than long, the second and third are very slightly longer than broad, and the following become progressively elongated, being between four and five times as long as broad distally; the segments are cylindrical and smooth, with little or no development of spines on the distal edges. P_2 is 4 mm. long, very slightly stouter, composed of 12 segments of which the distal are more elongated than those of P_1. P_3 is 5 mm. long with about 12 segments, about as stout basally as P_2 but tapering more slowly and hence appearing stouter, with relatively shorter segments which beyond the third have prominently overlapping and finely spinous distal ends. The following pinnules resemble P_3.

The cirri have 17 segments of which the longest are from four to six times as long as the terminal diameter. The arms are about 30 mm. long.

Locality.—North Cape, New Zealand.

Depth.—Sixty fathoms.

Sarametra, gen. nov.

Genotype.—Zenometra triserialis A. H. Clark, 1908.

Diagnosis.—The division series and arm bases are very spiny; the very long rounded conical centrodorsal bears three regular columns of cirrus sockets in each radial area, the radial areas being delimited by broad bare lines; the cirri have 50–60 segments of which the proximal are more or less elongated and the distal are short, never longer than broad, and bear prominent dorsal spines; all of the pinnules are present; the size is large, the arms being about 150 mm. long.

Geographical Range.—Known only from the Hawaiian Islands.

Bathymetrical Range.—Between 346 and 633 meters.

Included Species.—Sarametra triserialis (A. H. Clark).

Orthometra, gen. nov.

Genotype.—Trichometra hibernica A. H. Clark, 1913.

Diagnosis.—The cirrus segments, which are 25–33 (usually nearer the latter) in number, are cylindrical, without expanded distal ends, and short, the longest (third-fifth) being about one-third again as long as broad, and the distal slightly broader than long; the elements of the IBr series and the lower brachials are without lateral processes, and are widely free laterally.

Geographical Range.—Known only from the western coast of Ireland.
Bathymetrical Range.—From 698 to 900 meters.
Included Species.—Orthometra hibernica (A. H. Clark).

Tonrometra, gen. nov.

Genotype.—Antedon remota P. H. Carpenter, 1888.
Diagnosis.—The cirrus segments, which are not more than 20 in number, are all short, the longest being not so much as twice as long as the median diameter, and have much swollen distal ends; the IBr series and lower brachials are in close lateral contact.
Geographical Range.—Moluccas to Marion Island, southeast of Africa.
Bathymetrical Range.—From 1089 to 2880 meters.
Included Species.—Tonrometra brevipes (A. H. Clark) and *Tonrometra remota* (P. H. Carpenter).

Fariometra, gen. nov.

Genotype.—Trichometra explicata A. H. Clark, 1908.
Diagnosis.—The centrodorsal is sharply conical with straight sides, nearly or quite as high as broad at the base; the proximal cirrus segments are elongated, at least twice as long as the median diameter and usually much longer.
Geographical Range.—Philippine Islands to Celébes.
Bathymetrical Range.—From 509 to 1314 meters.
Included Species.—Fariometra explicata (A. H. Clark), *Fariometra scutifera* A. H. Clark, and *Fariometra dione* A. H. Clark.

Nepiometra, gen. nov.

Genotype.—Antedon laevis P. H. Carpenter, 1888.
Diagnosis.—The centrodorsal is rounded conical or hemispherical, not so high as broad at the base; the proximal cirrus segments are elongated, at least twice as long as the median diameter, and usually much longer; the brachials do not have strongly produced and very spinous distal ends; at most the distal edges of the outer brachials are bordered with fine spines; the cirri have 20–30 relatively short segments of which the last 6–13 are only very slightly, if at all, longer than broad; the pinnules are not especially long, and the distal pinnules are of the same length as the proximal; P_2 resembles P_3 and the following pinnules and is slightly longer and stouter than P_1 with somewhat fewer segments which are proportionately longer; P_2 may bear a gonad, though these usually begin on P_3; the arms are between 25 mm. and 60 mm. in length.
Geographical Range.—Kei and Meangis Islands and southern Celébes; ? Galápagos Islands and Panamá.
Bathymetrical Range.—From 204 to 1158 (?1760) meters.
Included Species.—Nepiometra obscura (A. H. Clark), *Nepiometra alcyon* (A. H. Clark), *Nepiometra laevis* (P. H. Carpenter), *Nepiometra io* (A. H. Clark), and *Nepiometra* (?) *parvula* (Hartlaub).

Phrixometra, gen. nov.

Genotype.—*Antedon longipinna* P. H. Carpenter, 1888.

Diagnosis.—The centrodorsal is rounded conical or hemispherical, not so high as broad at the base; the cirri are about XXX, 20–25; the proximal cirrus segments are elongated, at least twice as long as the median diameter and usually much longer; the brachials do not have strongly produced and very spinous distal ends; at most the distal edges of the outer brachials are bordered with fine spines; the pinnules are very long, the proximal longer than the distal; P_2 is very slightly shorter than P_1, but similar to it, with about 18 elongated segments; the following pinnules are similar; the arms are about 20 mm. long.

Geographical Range.—Southeastern South America.

Bathymetrical Range.—Known only from 1080 meters.

Included Species.—*Phrixometra longipinna* (P. H. Carpenter).

ABSTRACTS

Authors of scientific papers are requested to see that abstracts, preferably prepared and signed by themselves, are forwarded promptly to the editors. Each of the scientific bureaus in Washington has a representative authorized to forward such material to this journal and abstracts of official publications should be transmitted through the representative of the bureau in which they originate. The abstracts should conform in length and general style to those appearing in this issue.

GEOGRAPHY.—*The Navajo country, a geographic and hydrographic reconnaissance of parts of Arizona, New Mexico, and Utah.* HERBERT E. GREGORY. U. S. Geological Survey Water-Supply Paper 380. Pp. 219, with maps, sections, and illustrations. 1916.

The Navajo country includes 25,000 square miles of arid and semi-arid lands occupied by about 32,000 Indians and 500 whites. Only a small part of it has previously been described. The report, therefore, includes an unusually full treatment of geography under the heads: historical sketch, geographic provinces, climate, soil, flora, fauna, mineral wealth, population, and industries. Many additions have been made to existing maps, and the list of geographic terms has been revised. Since the future of the country depends upon the solution of the problem of water supply, particular attention was given to the occurrence of surface and ground waters. The Colorado and the San Juan rivers are perennial; all others are intermittent or ephemeral, but their flood waters may be utilized by construction of suitable works. Many springs and seeps may also be developed. The sinking of wells in deposits of various types is recommended, and the parts of the region favorable for artesian flows are indicated. Except for structure sections and maps and the description of water-bearing beds, the report contains little strictly geological material. Such matter will appear in Professional Paper 93, now in preparation. H. E. G.

GEODESY.—*Precise leveling from Reno to Las Vegas, Nev., and from Tonopah Junction, Nev. to Laws, Cal.* H. G. AVERS and G. D. COWIE. U. S. Coast and Geodetic Survey, Special Publication No. 39. Pp. 49. 1916.

This publication gives the results of a line of levels run in 1915 along the railroads between Reno and Las Vegas, Nevada, and between

Tonopah Junction, Nevada, and Laws, California. The line is 547 miles long and fixes the elevations of 228 permanent bench marks. The elevation of the top of rail in front of the railroad stations along the line was also determined. The elevations of the bench marks and of the top of rail in front of the railway stations are given in meters and also in feet. As in all precise leveling in the United States the datum used is mean sea level. The highest point of the line is at Sunland, Nevada, 2171 meters (7122 feet).

The result of a study of the errors of leveling is also given in this publication. The practice of the observer, while setting up the instrument, always to face in the same direction with respect to the line of progress had a tendency to make the line of sight higher for the back sights than for the fore sights. The effect of this has been eliminated by the observer facing in opposite directions at alternate set-ups of the instrument. H. G. A.

GEOLOGY.—*Geology of the Hound Creek district of the Great Falls coal field, Cascade County, Montana.* V. H. BARNETT. U. S. Geological Survey Bulletin 641-H. Pp. 215–231, with 1 plate. 1916.

This paper describes the geologic formations, the structure relating to the occurrence or absence of coal-bearing rocks, and the coal resources of the Hound Creek district. The rocks that crop out in the district belong to the Carboniferous, Jurassic, and Cretaceous systems, but detailed study was confined to the coal-bearing Kootenai formation (Lower Cretaceous). R. W. S.

GEOLOGY.—*Contributions to the geology and paleontology of San Juan County, New Mexico. I. Stratigraphy of a part of the Chaco River Valley.* CLYDE MAX BAUER. U. S. Geological Survey Professional Paper 98-P. Pp. 271–278, with 8 plates. 1916.

This paper is an attempt to set forth the principal features of the stratigraphy in a part of the San Juan Basin, to describe the succession of strata irrespective of possible correlations and thereby to establish a type section for the formations exposed, and to bring out their relations to the strata immediately above and below.

The area studied and mapped comprises about 1500 square miles in northwestern New Mexico extending along Chaco River for about 50 miles from the Great Hogback to Meyers Creek. It includes the outcrops of strata overlying the Mesaverde formation, which have in the

past been referred to the Lewis, Laramie, Puerco, Torrejon, and Wasatch formations.

The stratified rocks of this area consist of a succession of marine, brackish-water, and fresh-water sediments, which now occur as sandstone, slate, coal, and conglomerate, in almost every gradation and combination possible. The strata throughout the greater part of the area dip from 1° to 3° toward the center of the basin. The Mesaverde and Lewis formations and the Pictured Cliffs sandstone are accepted as described by previous workers in the San Juan Basin. The beds above the Pictured Cliffs sandstone that have been classed by others as Laramie are divided into mappable lithologic units and described as the Fruitland formation, Kirtland shale, and Ojo Alamo sandstone. A bibliography is included. R. W. S.

GEOLOGY.—*Some manganese mines in Virginia and Maryland.* D. F. HEWETT. U. S. Geological Survey Bulletin 640-C. Pp. 37–71, with 7 figures. 1916.

Six deposits of manganese ore are described with regard to location, geology, and occurrence and origin of the ore. Maps show the surface relations and underground workings of three mines. Replacement deposits of four types are recognized—deposits (1) in residual clay, (2) in the clay of a fault zone, (3) along pervious zones in schistose rocks, and (4) in sediments that fill an ancient channel. Five of the deposits are on the east side of the Great Valley in western Virginia and one is near Lynchburg in the Piedmont region.

The conclusion is tentatively reached that all of these deposits, and probably many more in the belt extending from Maryland to Georgia, were formed while the early Tertiary peneplain was being established in this general region. Four of the deposits outcrop on ridges and spurs that have been so isolated since the peneplain was dissected that they have received little surface drainage since that time, but each of the deposits contains much more manganese than could be derived from the decomposition of a mass of rocks having the volume of the residual clays in which the deposits occur. The clays and manganese minerals have been mined from 200 to 260 feet below the surface and from 170 to 220 feet below water level. In two mines the zone of residual clay and associated manganese minerals extends 105 and 130 feet, respectively, below the level of the nearest streams, which flow in channels cut in bedrock. It therefore appears that the sedimentary rocks of the region may undergo thorough decomposition

to greater depths not only below an extensive erosion surface but also below the present water level than has previously been considered possible. D. F. H.

GEOLOGY.—*Geology of the Upper Stillwater Basin, Stillwater and Carbon Counties, Montana.* W. R. CALVERT. U. S. Geological Survey Bulletin 641-G. Pp. 199–214, with 2 plates. 1916.

The rocks of this area comprise a great thickness of strata ranging from the coal measures of lower Montana (Upper Cretaceous) age to beds more than 8000 feet above the base of the Fort Union formation, of Eocene age. Older sedimentary formations and crystalline rocks are exposed in the Beartooth Mountains, along whose north base there is a profound fault that brings Paleozoic rocks into contact with Tertiary formations south of Red Lodge and with successively older strata to the west.

The Cretaceous and younger rocks, both sedimentary and igneous, are described, together with the geologic structure, which is simple. A discussion of the coal resources is followed by a statement concerning oil prospects. R. W. S.

ENGINEERING.—*Surface water supply of the United States, 1913, Part X, the Great Basin.* NATHAN C. GROVER, et al. U. S. Geological Survey Water-Supply Paper 360, Pp. 293, with 2 plates. 1916.

Surface water supply of the United States, 1914, Part I, North Atlantic slope basins. NATHAN C. GROVER, et al. U. S. Geological Survey Water-Supply Paper 381. Pp. 192 and XXXI, with 2 plates. 1916.

Surface water supply of the United States, 1914, Part II, South Atlantic and eastern Gulf of Mexico basins. NATHAN C. GROVER, et al. U. S. Geological Survey Water-Supply Paper 382. Pp. 66 and XXX, with 2 plates. 1916.

Surface water supply of the United States, 1914, Part VII, Lower Mississippi River basin. NATHAN C. GROVER, et al. U. S. Geological Survey Water-Supply Paper 387. Pp. 60 and XXXIV, with 2 plates. 1916.

Surface water supply of the United States, 1914, Part XII, North Pacific drainage basins, B, *Snake River basin.* NATHAN C. GROVER, et al, U. S. Geological Survey Water-Supply Paper 393. Pp. 248, with 2 plates. 1916.

The water-supply papers listed above are parts of a series giving the results of measurements of flow of streams in the basins indicated in the titles. Numbers 382 and 387 contain appendixes giving lists of stream-gaging stations and publications relating to the water resources of the basins. B. D. W.

ENGINEERING.—*The measurement of silt-laden streams.* R. C. PIERCE. U. S. Geological Survey Water-Supply Paper 400-C. Pp. 39–51, with diagrams. 1916.

San Juan River, in Colorado, New Mexico, and Utah, carries an unusually heavy load of silt, especially during the torrential floods that often occur. The formation of "sand waves" is an interesting phenomenon connected with the heavy silt burden of this stream. Flood measurements are very difficult and sometimes impossible because of the heavy silt load and the accompanying conditions, such as high velocities, trash and drift, shifting channel, and rapid variations in stage. By the use of a stay line and a 60-pound torpedo-shaped weight to hold the current meter in position, with a windlass built into one end of the gage car for handling the meter and weight, it was found possible to obtain measurements during all except the very worst conditions. In spite of the difficulties a good record of the stream flow was obtained. R. C. P.

ENGINEERING.—*Surface waters of Massachusetts.* C. H. PIERCE and H. J. DEAN. U. S. Geological Survey Water-Supply Paper 415. Pp. 433, with 12 plates. 1916.

This volume contains the results of stream-flow investigations in Massachusetts, and a compilation of the available records. The data are arranged on the basis of the climatic year ending September 30, that being the division of the year now generally used by the Geological Survey throughout its work of water-resources investigations. The report contains an introduction by N. C. Grover, briefly sketching the uses and development of the water resources of Massachusetts, which have at all times played an important part in the industrial and commercial development of the Commonwealth. An article on Topography by Arthur Keith outlines the geology of Massachusetts with special reference to the various drainage basins, and gives in non-technical language the geologic history of the river systems. The tables of discharge, showing the flow of the rivers as measured at the gaging stations, are followed by a gazetteer of streams, which lists and describes all the streams, lakes, and ponds shown on the topographic maps of

Massachusetts. A contour map on a scale of 1 : 250,000, printed in colors, shows the principal drainage basins and the location of gaging stations. C. H. P.

ENGINEERING.—*Accuracy of stream-flow data.* N. C. Grover and J. C. Hoyt. U. S. Geological Survey Water-Supply Paper 400-D. Pp. 53–59. 1916.

Records of stream flow at different gaging stations vary in accuracy with the permanence of the stage-discharge relation, the precision with which the discharge rating curve is defined, the refinement of gage readings, the frequency of gage readings, and the methods of applying the daily gage heights to the rating table to obtain the daily discharge. The contributing factors are so complex that it is generally not practicable to determine mathematically the probable error. A knowledge of the approximate accuracy is needed to apply intelligently the records to different uses; and a knowledge of the sources of error and their relative effects on the accuracy of the records is essential to the proper collection of data for different uses requiring different degrees of accuracy. A study of the accuracy of the records to be collected at any station, therefore, should begin with the reconnaissance for the site and continue through the selection, establishment, maintenance, and operation of the station, the computation and interpretation of the data, and the preparation of the records for publication.

N. C. G.

TECHNOLOGY.—*The resistance of an oil to emulsification.* Winslow H. Herschel, Bureau of Standards Technologic Paper No. 86. Pp. 37. 1917.

In this paper is described a new test for the emulsification of oils. Certain results obtained by such measurements are also discussed. The test may be briefly described as follows: 20 cc. of the oil to be tested and twice that volume of distilled water are heated to 55°C. in a 100 cc. cylinder, 26 mm. inside diameter, and stirred for five minutes at a speed of 1500 r.p.m. The cylinder and contents are allowed to stand at the same temperature, and readings are taken at more or less frequent intervals (according to the type of oil) of the volume of oil settled out from the water. From these readings, a maximum rate of settling, called "demulsibility", is easily taken from a table. The paddle is simply a plate of metal 8.9 by 20 by 1.5 mm. Since the test is not sensitive to slight changes of paddle dimensions, they need not be exact, and no calibration is required.

W. H. H.

PROCEEDINGS OF THE ACADEMY AND AFFILIATED SOCIETIES

THE CHEMICAL SOCIETY OF WASHINGTON

The 263rd meeting of the society was held at the Cosmos Club, October 12, 1916. The program of the meeting consisted of reports from members of the section upon the various activities at the Fall Meeting of the American Chemical Society at New York City, and on the Second National Exposition of Chemical Industries. W. D. BIGELOW, director of the society, reviewed particularly the work of the directors and the reorganization of the management of the *Journal of Industrial and Engineering Chemistry*. J. JOHNSTON, councilor of the section, dealt especially with the majority and minority reports of the Committee on the Proposed Code of Professional Ethics and the work of the Division of Inorganic and Physical Chemistry. Others presenting brief reviews of papers presented at the meetings of the various sections were I. K. PHELPS, L. F. KEBLER, R. B. DOLE, L. C. WELLS, J. B. TUTTLE, and W. BLUM. H. D. GIBBS gave an account of the Exposition and the various symposiums on subjects of present industrial importance.

The 264th meeting, held at the Cosmos Club, November 9, 1916, was devoted to the annual election of officers. The following were elected: *President*, C. S. HUDSON, Bureau of Chemistry; *Secretary*, E. C. MCKELVY, Bureau of Standards; *Treasurer*, F. P. DEWEY, Bureau of the Mint; *Councilors*, R. B. SOSMAN, Geophysical Laboratory, E. B. PHELPS, Hygienic Laboratory, and R. C. WELLS, Geological Survey; *Executive Committee*, J. C. HOSTETTER, Geophysical Laboratory, F. W. SMITHER, Bureau of Standards. F. C. COOK, Bureau of Chemistry, A. SEIDELL, Hygienic Laboratory, F. A. WERTZ, Bureau of Standards, P. B. DUNBAR, Bureau of Chemistry.

The 265th meeting of the society was held as a joint meeting with the Botanical Society of Washington at the Cosmos Club, November 23, 1916.

Dr. FREDERICK B. POWER, of the Bureau of Chemistry, until recently with the Wellcome Burroughs Laboratory, London, gave an address upon the *Aims and developments of phyto-chemical research*. The speaker presented the results and conclusions drawn from a great amount of work carried out in laboratories abroad and largely published in detail in British journals. Particular emphasis was placed upon the enormous opportunity for development in this almost

untouched field of scientific endeavor. Chaulmoogra oil was taken as an example of a phyto-chemical material upon which a great amount of work for the purpose of determining its structure and constitution had been carried out by the speaker and his associates.

The 266th meeting of the society, held at the Cosmos Club, December 14, 1916, was devoted to the presentation of motion pictures showing the manufacture of steel pipe, sheet tin, and tin plate. These pictures were furnished by the courtesy of the American Sheet Tin and Tin Plate Company of Pittsburgh and were presented by D. M. BUCK, Metallurgical Engineer of Pittsburgh.

The 267th meeting of the society, a joint meeting with the Washington Academy of Sciences, was held at the Cosmos Club, January 11, 1917. R. B. SOSMAN, retiring president of the Chemical Society, presented an address on *Some problems of the oxides of iron* (this JOURNAL, 7: 55–73. 1917).

E. C. MCKELVY, *Secretary.*

THE SOCIETY OF AMERICAN FORESTERS

At the annual meeting of the Society, held at the University Club, January 18, the following officers were elected for the ensuing year: *President*, FILBERT ROTH; *Vice-President*, WILLIAM T. COX; *Secretary*, R. Y. STUART; *Treasurer*, C. R. TILLOTSON; *Executive Council*, W. B. GREELEY, five years, H. S. GRAVES, four years, R. C. BRYANT, three years, D. T. MASON, two years, CLYDE LEAVITT, one year.

R. Y. STUART, *Secretary.*

THE ANTHROPOLOGICAL SOCIETY OF WASHINGTON

The 505th regular meeting of the Society was held January 16. At this meeting Mr. WILLIAM H. BABCOCK presented a paper on *Certain pre-Columbian notices of the inhabitants of the Atlantic islands.*

Beginning at the north, the speaker referred to the well known Norse colonization of Iceland in the latter part of the ninth century and to the much earlier establishment of Irish monks at some points of its coast. From numerous Celtic local names Dr. Nansen has argued that there may have been a much greater inland Irish settlement. But perhaps these names should be explained by the fact that there were many Irish and Hebrideans among the early Norse colonists. There are also mentions of "trolls" in the saga of Grettir—and perhaps elsewhere in early Norse writings—as inhabiting hidden places of the mountainous interior. These may possibly preserve the memory of aboriginal survivals from pre-Norse and pre-Irish times, but more probably they merely echo old Norse traditions or are freaks of fancy.

Farther south, perhaps the oldest record is Plato's Atlantis derived from his ancester Solon, who received it, as we are told, from the Egyptian priests of Sais. The speaker related it in slightly condensed form with special heed to anthropologic items, but expressed the opinion that

it merely reflects the civilized life of Plato's time on the Mediterranean shores and throws no light on mankind in the Atlantic. He recited also the description of a far western island, which seems to be Madeira, given in the time of Julius Caesar by Diodorous Siculus, and added the same estimate. He held that this applies also to Plutarch's interesting account of Ogyggia, possibly Ireland or Iceland and the continent beyond it; also to the Irish Sea romances, or Imrama, though the home life which they at times repeated in their tales was very different from the life of the Mediterranean.

In the Geography of the Arab writer Edrisi (about 1154) we seem to find, perhaps for the first time, notes of observations of real human beings on the islands of the eastern Atlantic. A list of these was given with most of the relevant items, showing great diversity in matters of culture, perhaps also of race, but in part agreeing very well with fourteenth and fifteenth century accounts of the Canary Islanders. His sources were partly mythical, partly recent Arabic, and to some extent probably also European, both classic and mediaeval. It is impracticable to identify each island; but some of them are doubtless to be located among the Canaries, one is perhaps Madeira, and two or three at least should be credited to the Azores. We have nothing certain and explicit concerning the latter after this time until the Portuguese colonization, which seems to have found no one in possession, but fortunately there is a considerable body of information as to the Canary Islanders.

The speaker quoted from Major's introduction to the *Canarien* of Bontier and Leverrier, a translation of a letter written at the end of 1341 by certain Florentine merchants dwelling in Seville, Spain, narrating an expedition to the Canary Islands that year, of three Portuguese ships manned partly by Italian seamen. It constitutes one of the best reports ever made of the people of the Canary Islands, who at that time were less affected by European interference than afterward.

Mr. BABCOCK mentioned a brief settlement of thirteen Spaniards in Grand Canary in 1382, and also the conquest of the islands, begun by Bethencourt in 1402 and completed about 1485. From the same source (Major's introduction) the speaker quoted Azurara's narrative (in the *History of the Conquest of Guinea*, published in 1448) of a slave raid on the island of Palma, participated in by a Portuguese vessel in 1443, the quotation including some account of the inhabitants of the other islands. Further quotations were given from Cadmosto's report on the Canary Islands in 1455, about the middle of the conquest, some of the islands being then still unconquered and pagan. The speaker then gave, from the body of the *Canarien*, several selections presenting similar anthropological matter. A few words as to matters of race and culture closed the paper.

The presentation of the paper was followed by a general discussion of the subject in which the speakers were Dr. ALEŠ HRDLIČKA, Dr. JOHN R. SWANTON and Dr. TRUMAN MICHELSON.

FRANCES DENSMORE, *Secretary.*